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READING PERFORMANCE OF BILINGUAL CHILDREN ACCORDING TO TYPE OF SCHOOL AND HOME LANGUAGE

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This study examined bilingual children's performance in reading Persian and English at grades one, three and six. Two types of programs, one an immersion curriculum and the other a split curriculum where half the daily instruction is in one language and the remaining half is in the other, were compared with monolingual control schools. The results showed the bilingual children performing not quite as well as either of their monolingual peer groups, although the difference was more striking for Persian than English. A parallel processing theory of reading for bilinguals is proposed to account for the overall trend.

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READING PERFORMANCE OF BILINGUAL CHILDREN ACCORDING TO TYPE OF SCHOOL AND HOME LANGUAGE[1]

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In the course of the past two decades, various linguistic, sociological, and psychological aspects of bilingualism have been revealed, largely as a result of carefully controlled experiments with adults and adolescents. These studies, most of which have been carried out by Wallace Lambert and his colleagues at McGill University, have yielded a fairly comprehensive picture of the effect of the language acquisition context on bilingual performance, e.g., Lambert, Havelka and Crosby (1958), the attitudinal and motivational variables relevant to the attainment of bilingualism, e.g., Gardner and Lambert (1959), Anisfeld and Lambert (1961), Lambert (1967), and the relationship of bilingualism to intelligence, e.g., Peal and Lambert (1962), Lambert and Anisfeld (1969). More recently the focus of investigation has shifted to the educational setting. Four longitudinal studies deserve mention here, all of which have the same goal: to assess the effect of bilingualism on academic performance, linguistic and cognitive development from the time the child enters school.

The St. Lambert experiment, directed by Wallace Lambert and Richard Tucker (1972) (1973) serves as the basic model for these investigations. Here, two groups of Canadian children, whose native

[1]The authors gratefully acknowledge the grant from Tehran University which made possible the completion of this study.

language is English, were placed in an elementary school where the language of instruction was exclusively French in kindergarten and the first grade, and entirely in French from grades II through IV, with the exception of two half-hour periods in English per day. By the fifth grade, the curriculum was altered so that the students were receiving instruction in both English and French from bilingual rather than monolingual teachers, as had been the case in the previous grades. From grade V on, there was a continual decrease in the amount of English Arts instruction. At grade VII, the bilingual children were receiving 380 minutes of French a week to 350 minutes of English. The students' academic performance in French and English was assessed on a yearly basis by a battery of tests which measured linguistic skills such as listening comprehension, pronunciation, verbal production, academic subjects like reading and arithmetic, and intelligence and creativity.

The Allenby French immersion program in Toronto described by Barik, Swain and McTavish (1974) differs slightly from the St. Lambert experiment in that although the children involved are native speakers of English being taught entirely in French, the Allenby school is located in a monolingual English environment as opposed to the largely bilingual English-French environment of the St. Lambert district in Montreal. The curriculum at the Allenby school also differs from the St. Lambert project; the instruction is totally in French up to grade II, where the English language arts are then introduced for only one hour each day. One of the interesting consequences of the "immersion" curriculum is that the children initially begin reading and writing in their second language, French. Barik,

Swain and McTavish describe an evaluation of kindergarten and grade I classes which was carried out in the Spring of 1973. As in the St. Lambert experiment, the researchers compared the Allenby children--samples from both grades were used (12 from kindergarten, 15 from grade I) rather than entire classes--with control classes from the same school.

The Culver City Spanish immersion program is another replication of the St. Lambert model. Andrew Cohen (1974) reports that in the fall of 1972, fifteen English-speaking children who had received instruction entirely in Spanish in kindergarten at Linwood Howe School in Culver City, California, continued this pattern in grade II. Six monolingual and near-monolingual children were added to this class to assist in promoting a favorable attitude toward Spanish on the part of the Anglo students, and to provide a rationale for maintaining the policy of using Spanish as the sole medium of instruction. Cohen and his colleague Broadbent collected data on the experimental group's performance at the end of their first two years in this program and measured this against monolingual English and Spanish control groups. Linguistic measures like the Berko English Morphology Test, an English Story telling test, a grammar test and academic tests, the Inter-American Puebla de Lectura (Reading Test), and the Cooperative Primary Test of Math were employed.

In contrast to these three "immersion" programs, the Elgin County Ontario bilingual project divides instruction in the two languages according to the time of day and subject matter. In this 50-50 program, begun in 1970, Mathematics, Music and French

Language Arts are taught in French in the morning, and English Language Arts, Physical Education and other subjects are instructed in English in the afternoon. An evaluation carried out for grades one through three in the Spring of 1973 is reported by Barik and Swain (1974). Intelligence, academic performance in reading and math, and aural comprehension were measured in English, and the children's scores were compared with those of an English monolingual control group. At grades two and three, the Elgin children were given a French comprehension Test and the IEA Listening Test of French as a foreign language (Population I Level); their performance was evaluated in terms of established norms for these tests.

Of particular interest is the acquisition of reading skills by the children in all of these studies, since their performance would provide support for or refutation of the relatively old notion that reading should be begun in the vernacular. This thesis, which draws some support from studies like Berra-Vasquez (1953), Burns (1968), Modiano (1966) and Österberg (1961), is presumably based on the following rationale: the child should first learn to make the symbol-sound-meaning amalgamations, which constitute the earliest step in reading, in the language he is most proficient in, his own. Once a firm basis for reading has been established in the first language, transfer of reading skills to the second language may occur.

With regard to the development of reading competence in the native language, English, the four studies show differing results. The St. Lambert children lag behind their monolingual English

counterparts until the end of grade III where they attain equivalence and maintain it for the ensuing four years. At the end of the first grade, the Allenby children are significantly lower than the first grade monolingual English control group, but the Culver City children outperform the monolingual English children, although not significantly. The Elgin study shows a fluctuation. No significant difference from the control group is evidenced at grade I, but the experimental children score lower than the monolingual children at grade II. They regain equivalence with the English control children at grade III, a fact which led Barik and Swain to hypothesize that 50-50 programs "may cause students initial confusion as they attempt to develop linguistic skills in two languages concurrently, resulting in a negative effect on the native language skills" (Barik and Swain 1974:402).

In attempting to account for the fact that immersion programs achieve comparable or superior results to 50-50 programs when English reading is the measurement criterion, Barik and Swain hypothesize that learning French may be easier ". . . because French has a more systematic sound-symbol correspondence than . . . English." They conclude that after the child has learned the fundamentals of reading in French, a transfer to English, their native language may be relatively natural consequence.

The notion that a language like French, which has a "one-to-many" sound-to-symbol correspondence, i.e., one sound has different spellings, may be easier for young children to learn to read than a language like English, which has a "many-to-many" relationship, i.e., a given sound may have different spellings and one letter or sequence of letters may stand for one or more sounds (plus the

added difficulty of silent letters) is not entirely unreasonable. One might expect transfer of elementary reading skills when the languages in question use the same alphabetical systems, have a large number of cognates and similar syntactic structures. Citing words from one of the tests used in the St. Lambert experiment, Lambert and Tucker (1972:82-83) present a fairly convincing case for the proposition that English reading skills may have been promoted via transfer from French cognates at the first grade. But what if the languages and their orthographies differed widely from one another? Under these conditions, the transfer of basic reading skills could be marginal or nonexistent. Furthermore, it is conceivable that proficiency in reading equivalent to monolingual ability might not be attained in either language.

A test case might be two languages like Persian and English, which have dissimilar syntactic structures and orthographies. Although they both have alphabetic writing systems, the differences between the two languages are many. English is written from left to right, Persian from right to left. In English, the letters of the alphabet have a constant shape regardless of where they appear in a word, in Persian each of the thirty-two symbols has three shapes depending upon whether it occurs at the beginning or end of a word, e.g., the letter "ye" has the shape يـ word initially, and ـيـ word medially and ـی word finally. Although it could be said that some lower case letters in English resemble each other, e.g., b and d, p and g, twenty-two of the Persian alphabetic letters are distinguished from one another by only the presence or absence of a dot or stroke. For example, consider the initial shape of

the three letters "jim," "che," "he," and "khe": ج ، چ ، ح ، خ ، English vowels may be pronounced differently but they are always represented by a given alphabet letter or combination of letters; in Persian three vowels /æ/, /o/, and /a/ are not represented in script. English possesses upper and lower case letters, Persian has only lower case letters. Persian has fewer rhetorical symbols and devices than English most notably: paragraph indentation, the period, the comma, the exclamation mark and the question mark. And finally, the division between words on a printed page is not as obvious in Persian as it is in English.

The first objective of the experiment reported here was to investigate the extent to which elementary school children in bilingual programs in Iran could learn to read two languages, English and Persian, which have quite different linguistic and writing systems. We were particularly interested in observing whether a pattern similar to that found by the St. Lambert researchers would be revealed. In the Canadian project, the bilingual children attained reading scores comparable to their monolingual peers in only one language, their native English. But by the end of grade VII, they were still not reading as well in French as the control group children (see Bruck, Lambert &Tucker, 1975)In order to obtain a basis for comparison, it was decided to examine Iranian bilingual children's reading ability at the first, third and sixth grades.

Another goal of this study was to determine the extent to which the type of program, immersion or 50-50, would contribute to the attainment of reading competence in bilingual programs. To this end, we obtained access to Iranian schools with bilingual

programs nearly identical to those of the St. Lambert and Elgin County projects. Finally, we were interested in the contribution of a variable which did not enter into the assessments of the programs described earlier--home language environment. Some children attending Iranian bilingual programs come from homes where the parents know and speak both Persian and English, others have parents who speak exclusively one language or the other. Would this affect acquisition of reading competence in one or the other language? To assist investigation of this question, subjects were classified according to the type of home language environment--monolingual English, LE, monolingual Persian, LP, and bilingual, LB (one parent, usually the father is a native Iranian, and the mother is usually English or American).

METHOD

The experiment described here was a cross sectional investigation conducted over a three-week period in the latter part of May, 1974 in Tehran.

Subjects

The subjects were students in the first, third and sixth grades at two monolingual Persian schools, one monolingual English school and three bilingual schools. Entire classes averaging about twenty-five students were examined. The exact number of subjects in school, grade and linguistic grouping may be found in tables 1 and 5. The biographical data on all students was carefully researched with the help of the teachers and the principals. This

data, which was used to classify the students as to home linguistic environment, was double checked with the students, and, when it was deemed necessary, with the parents.

School Types

Five types of schools were involved. Type B/Im consists of two schools with immersion programs like the St. Lambert school. All instruction is in English with the exception of one and a half hours devoted to Persian each day. Type B/1/2 contains one school with a bilingual program almost identical to the schools in the Elgin study. In the morning all subjects are taught in English; Persian is both the medium of instruction and in part the subject matter in the afternoons. With respect to time, English comes out slightly ahead, since morning sessions last three hours, while the afternoon program is two and a half hours long. Type P/up is a control group school where all subjects are taught in Persian. In order to provide a more comprehensive picture of how socioeconomic status was reflected in academic performance, two monolingual Persian control groups were chosen. Students from P/up come from the middle and upper classes, only lower class children attend school P/low. P/up offers two to three hours of English instruction each week beginning in the third grade. The same amount of English instruction is introduced at P/low in grade VI. Finally, type Eng/C represents the English control group school. This school does not, as a rule, accept any Iranians, and all instruction is in English.

Tests

Form 1, Levels A, C and D of the Gates MacGintie (1965) reading

comprehension and vocabulary tests were used to evaluate English reading proficiency. The California Test of Mental Maturity was administered to all subjects (a Persian version was developed for the Persian control groups). This test was included in the experiment for two reasons: first, we wanted to provide a means for determining whether unusually high or low performance on any reading test might be attributed to I.Q., and, secondly, we wished to further study the effect of the bilingual experience on cognitive development, since this had been a part of every one of the previously-mentioned studies. These two standardized tests were scrutinized to detect culturally inappropriate items, which were then either deleted or, in most cases, changed. The long form of California Test of Mental Maturity was judged too long, and sections of it were accordingly deleted to bring it within a manageable length.

During the period 1972-73, the experimenters developed and pretested Persian reading tests similar to the Gates McGintie tests. A Persian word list drawn from all of the primary school primers for grades I, III and VI prescribed by the Ministry of Education was compiled. Items from this list were subsequently incorporated in the tests being designed. The final versions of the Persian tests contained two parts: vocabulary recognition and comprehension of larger stretches of prose. The vocabulary section of the grade I test examines the child's ability to pick out a word represented in a picture from a group of words with similar shapes. In the comprehension section, the child must mark a picture which represents a sentence that the child reads. Examples are shown in Figure 1.

Insert Figure 1 about here

At the more advanced levels, the student simply selects the proper synonym for the test words in the vocabulary section. In the comprehension section, the student is faced with a more modified cloze approach where he must choose from one of five alternatives to fill in the blanks of the sentences in the paragraph. The example shown in Figure 2 is from the comprehension test of the third grade reading test.

Insert Figure 2 about here

All tests--Persian and English reading, Persian and English I.Q.--were pretested in the schools, item analyzed, and items with a low discrimination index were rewritten. All in all, the writing, pretesting and rewriting consumed a year and a half. Reliability coefficients computed by the method of analysis of variance for the Persian tests used in the experiment were never less than .98. The conclusions reported in this study are based on the data from Persian and English reading tests. The results of the intelligence test will be reported in another paper.

Testing Procedure

The tests were administered during three weeks in May and June of 1974. In order to insure that the administration procedure was consistent, the testing was carried out by and large by the authors. No test lasted longer than one hour and a quarter, and most of the reading tests lasted only thirty-five minutes. Rest periods which

occurred every twenty to thirty minutes were built into the longer tests, so that the children were never subjected to extended periods of answering questions. Directions to the students on how to take the test were given in the language corresponding to the test.

RESULTS

The data may be conveniently organized in terms of three comparisons, each of which provides specific answers to subparts of the questions posed earlier. Our first comparison is intended to answer the following questions: (1) how do the children in the bilingual programs perform in reading Persian in relation to the monolingual Persian control group? and (2) is there any consistent pattern of relative standing in terms of Persian reading ability across grades?

A one-factor analysis of variance was used for both vocabulary and comprehension scores in each grade. Whenever significant F values were found, multiple comparisons were made using Scheffe's method of contrasts (Glass and Stanley, 1970:388-392). In cases where the variances of each school appeared to be heterogeneous, an estimate of error variance for each contrast was computed from the cells being compared.

The upper portion of Table 1 shows the number of subjects, the means and the variance of the Persian vocabulary and comprehension tests as arranged according to grade school and home linguistic environment. The lower half of the table shows the analysis of variance for the bilingual and Persian monolingual schools as computed from the Persian reading test scores. Note that there are

significant F values for the two independent variables in all three grades.

Insert Table 1 about here

Comparisons of the bilingual schools and monolingual Persian control schools on both sections of the reading test according to grade may be found in Table 2. Only comparisons of significant difference on at least one measure are entered.

Insert Table 2 about here

At grade I, the Persian monolingual control group from the upper class school is significantly better than the bilingual immersion group and the lower class monolingual Persian group in vocabulary. Although the two bilingual schools do not differ significantly in either of the two measures, the means of the 50-50 bilingual school are high enough so that they do not differ significantly from the Persian upper class control group. These results contrast sharply with the picture of first graders' performance found in both the St. Lambert and Elgin studies. In the former, the immersion children scored as well as the control group children in reading French, but the children involved in the latter study were only equivalent to an immersion kindergarten class.

Comparisons of the means at grade III show consistent differences in both measures, the Persian monolingual upper class

school now being significantly better than the immersion school and the lower class Persian monolingual school. The upper class Persian school is significantly better than the 50-50 school, but only in vocabulary. This contrasts once again with the Canadian studies, where the St. Lambert immersion children, although not on a par with their monolingual peers in French reading, still far surpassed the 50-50 children of the Elgin project. Of particular interest is the fact that both bilingual schools are significantly better than the lower class Persian monolingual school.

The pattern of significant differences is consistent again in both measures at Grade VI. Now, however, the upper class monolingual school is significantly better than all of the other schools. Again, there is no significant difference between the bilingual schools, which are no longer significantly better than the lower class Persian school. It should be noted that the sixth grade reading scores for the 50-50 school are drawn from one sixth grade class and one fifth grade class. The principal of the school felt that the fifth grade class contained more students who had been in the bilingual program since kindergarten and it would thus be more representative than the sixth grade class, which was said to contain more transfer students. In fact, the test results showed no differences between the two classes on reading comprehension, but the sixth graders surpassed the fifth graders in knowledge of vocabulary.

To summarize, the data in Table 2 clearly indicate the consistency of both measures across grades. Two consistent trends emerge: the superiority of the upper class monolingual Persian

school over the other schools, and the lack of a significant difference between the bilingual schools.

The second major comparison was undertaken to answer the following questions: how do the two bilingual schools compare in terms of English and Persian reading ability? Do the students with different home languages differ significantly in their performance reading the two languages? Is there an interaction between schools and home language? For this comparison, the scores of the fifth and sixth grade children in the 50-50 bilingual school were pooled. This was done in order to have enough subjects for the three-way classification: LP: children speaking only Persian at home, LB: children speaking Persian and English at home, and LE: children speaking only English at home. It was felt that the pooling of the fifth and sixth graders in the 50-50 school was justified since they did not differ significantly in Persian and English reading comprehension or English vocabulary. Because of this decision to pool these two classes, Persian vocabulary was not a measure for the sixth grade in this comparison.

A two-factor analysis of variance with unweighted means was used for each of the measures in each grade. Multiple comparisons were made among the means using Scheffe's method (Winer, 1971:384-388). In cases where cell variances appeared heterogeneous, estimate of group variance for each comparison was computed either from the cells being compared (where the number in each cell was near or greater than 30) or from the appropriate columns or rows.

Insert Table 3 about here

As can be seen from the analysis of variance in Table 3, there is no significant effect at grade I, but significant school and home language effects in comprehension are present at grade III as well as a home language effect in vocabulary. At grade VI, only a home language effect in comprehension was obtained.

The multiple comparisons among Persian comprehension means of various home languages in Table 4 show similar results in grades III and VI. In both grades, LP and LB children are superior to LE children. The comparisons of Persian vocabulary means in grade 3 show only a significant superiority of LP over LE.

Insert Table 4 about here

Comparisons of the Persian cell means in grade III showed a significant difference between LP and LE in both bilingual schools. A schoolmain effect found at grade III is due mainly to categories LB and LE of the two bilingual schools. In grade VI, a significant cell means difference in comprehension between LP and LE of both schools was found.

Table 5 presents the number of subjects, means and variances of the English comprehension and vocabulary tests.

Insert Table 5 about here

The analysis if variance for English reading and comprehension for the bilingual schools is shown in Table 6. There is a significant school effect in both measures of Grade I, the 50-50 school

being superior to the immersion school. At grade III, a significant home language effect is found in both measures. Home language and school effects are significant in terms of vocabulary at grade VI, the immersion school now being superior to the 50-50 school.

Insert Table 6 about here

The multiple comparisons shown in Table 7 assist in interpreting the home language effects found at grades III and VI. The superiority of the children from bilingual homes over the children from monolingual Persian homes in comprehension at grade III is evident. The children from monolingual English homes also significantly surpass the children from monolingual Persian homes. Both the bilingual and monolingual English home environment children are significantly better than the monolingual Persian home environment children in vocabulary at grade VI.

Insert Table 7 about here

Although both the sixth grade bilingual and monolingual English home environment children outperform the monolingual Persian home environment children in English reading comprehension, the difference is not significant. The monolingual Persian home environment children attending bilingual schools appear to catch up in English reading comprehension as they advance through primary school. Just the opposite trend is evident for the children from

an English monolingual home environment with regard to acquisition of reading skills in the second language. These children become progressively worse both in Peruian vocabulary and comprehension compared to their monolingual counterparts. Two inferences may be drawn from this. First, it is quite obvious that the kind of transfer through vocabulary found by Lambert and Tucker is not occurring in this bilingual setting. Secondly, a reasonable hypothesis is that reinforcement by the language spoken at home is a prime factor in the development of the child's reading ability. The first language spoken at home determines the language they will read best particularly if that language is stressed in the later grades.

Our final comparison was aimed at answering the question: what is the relative standing of the children in the two bilingual programs when compared with a monolingual English control group? On the basis of the scores in the English reading comprehension and vocabulary obtained for the two bilingual schools in the previously described comparison, various poolings of groups were made. Groups which did not show significant differences were pooled together: at grade I, the various categories of home language environment were pooled in each bilingual school; the comparison was thus between the two bilingual schools and the monolingual English control school for both measures. The three home language environments were pooled together for the two bilingual schools at grade III. The groups compared at this level were thus LP (B/Im + B/ 1/2), (LP + LB) (B/Im + B/ 1/2), and Eng/C for both measures. The comparison groups formed for comprehension at grade VI were those used for grade III. For vocabulary only LB and LE were pooled in each

bilingual school. The comparison groups for vocabulary were therefore: B/Im LP, B/ 1/2 LP, B/Im (LB + LE), B/ 1/2 (LB + LE), and Eng/C. A one-way analysis of variance was performed at each grade, and multiple comparisons were made among defined groups whenever significant F values were found.

Insert Table 8 about here

As is evident from Table 8, a significant school or group effect was found across the three grades. The multiple comparisons displayed in Table 9 were therefore made. Again, only comparisons which produced significant differences on at least one measure are shown.

Insert Table 9 about here

At grade I, the 50-50 bilingual school is seen to be significantly better than the monolingual control school and the bilingual immersion schools. This is undoubtedly due to the fact that the B/ 1/2 school provides more reading readiness training than the other two schools. Of course, this factor was not controlled experimentally, so the result could as well be due to the nature of our sample in the first grade. The effect of home language is not yet evident in this grade, but as we go up to higher grades, this effect becomes more pronounced as can be seen from Table 9.

In the third grade, the two bilingual schools do not differ

significantly in English reading, neither do the children from bilingual and monolingual English differ from their English monolingual control. The only significant difference appears between these two groups and the children from Persian monolingual homes. In grade VI, the English monolingual control children are superior in reading comprehension to the children from monolingual Persian homes, but not the children from either of the other two home environments. In vocabulary, the English control school children are significantly better than the children from the monolingual home environments in both bilingual schools as well as the children from bilingual and English monolingual homes in the 50-50 bilingual school. But they do not differ significantly from the children in the immersion schools whose parents speak just English or both Persian and English.

DISCUSSION

The general picture is one of the bilingual children performing not quite as well as their monolingual counterparts in either of the languages despite the high degree of variations among the subjects. The differences in performance are more striking in Persian than in English. The bilingual children from Persian monolingual homes are significantly inferior to the Persian monolingual control of their same socioeconomic status children in reading Persian, whereas the bilingual children from English monolingual homes are not very different from their English monolingual controls in reading English. This result may be due to the nature of bilingual schools, where more emphasis is put on English. It may

also be due to the nature of the control groups. The Persian monolingual school was a more homogeneous and selected group than the English monolingual school where every English or American monolingual child is admitted. We believe that both factors may have been operating.

There was no consistent significant difference between bilingual schools across grades in any of the reading measures. One may hypothesize that the 50-50 school, despite its claim, does not give equal weight and emphasis to both languages. Mornings are devoted to English and afternoons to Persian and this division not only gives unequal hours to the two languages, the quality of learning may also be affected by it. In the mornings children are more alert and less tired, whereas in the afternoons they may not be so. Of course, a 50-50 school may have advantages over an B/Im school in aspects other than reading skill. For example, children of a 50-50 school may develop a more positive attitude toward Persian culture and heritage and this is an empirical question which can be tested in future investigations.

The overall trend evidence in this study--that the bilingual children did not read as well as the control groups in either language--is sufficiently distinct from the results of other studies, particularly the St. Lambert experiment, to warrant our tendering the following conclusions and hypotheses.

First, it is quite possible that academic performance of students enrolled in bilingual programs may vary considerably from country-to-country and depend more upon linguistic and socioeconomic variables than on the type of bilingual schooling. The

results of this study do not constitute an unqualified endorsement of the somewhat optimistic appraisal of bilingual education which occurs in the publications of the Canadian researchers. This point of view is best summarized by Bruck et al. (1974:203): ". . . bilingually-educated children show the same academic progress as their monolingually-educated peers." A more accurate assessment would append "in most subjects" to this statement.

Bruck et al. report on the progress of the St. Lambert children at the end of grade seven provides additional support for this judgment. Performance in French reading showed a marked decrease from the sixth grade level although the children still maintained equivalence with the English monolingual control group. Considering that the St. Lambert curriculum was altered in the sixth grade to provide the children with an almost equal amount of instruction in English and French and the importance of home language to performance in reading found in this study, the hypothesis that reinforcement from the home linguistic environment is the principal factor affecting long-term progress in the acquired linguistic skill of reading becomes more appealing.

In attempting to account for the bilingual children's overall performance, we should consider the external variables which might have been active. We will begin with what is generally thought to be the most influential variable, the sociolinguistic context. Although Persian (Farsi) is the main language of communication in Iran, knowledge of a second language is considered a desideratum for advancement in most fields. Indeed, all upper middle class and upper class members of society are presumed to have some command

of one foreign language, and both the King and the Queen speak at least two other languages. Parents who send their children to bilingual schools are members of the upper middle class and upper class. Their commitment to bilingual education is evident in their choice of a bilingual school over one of the better quality private monolingual schools. The children attending the bilingual schools have an extremely positive attitude toward the type of education they are receiving. This "integrative" orientation would seem to rule out the possibility that lack of motivation or a negative orientation toward the speakers of one or the other language is causing the decrement in performance.

A lack of equivalence between the bilingual and monolingual schools must likewise be ruled out as a plausible explanation of the outcome. One of the two bilingual schools is ranked among the top ten schools in Tehran, and the authors felt that the other bilingual school was qualitative close to the better monolingual schools.

Although linguistic competence is unquestionably a prime determinant in the development of reading skills, we do not believe that the bilingual children's performance is due to a less than native-like ability to speak one or the other language. We were unable to administer additional tests which might have produced more substantial evidence for or against this possibility, but we did conduct some informal interviews with the children in both languages. Our impression, which is obviously subjective, and does not conform to the rigorous standard of measurement required for experimental investigation, was that the bilingual children speak with an

extraordinary degree of competence, judged in terms of accuracy in the production of phonology and syntax. The children exhibited the ability to switch freely from one code to another, and their performance in both languages was frequently so fluent that we were often unable to distinguish them from their monolingual peers.

If we exclude the foregoing potential explanations, what accounts for the trend observed in the study? We will argue that it is due to a combination of cognitive processing and perceptual factors manifested in the written representation and the linguistic structure of the two languages.

That the English and Persian writing systems contrast sharply both in terms of their directional processing and general characteristics was noted earlier. Makita's (1968) evidence indicates that young children can learn to read two orthographies that are identical with respect to their indication of the sound system (the syllabaries katakana and hiragana) but that reading difficulties are not eliminated if the competing orthographic systems differ radically, as the logographic system, kanji, does from the aforementioned syllabaries. Although the writing systems in this bilingual setting are both alphabets, they are nevertheless strikingly different. Qazenfari (1975) has demonstrated experimentally that the characteristics of Persian writing can create ambiguities in perfectly normal sentences, and that these will interrupt the reading process for brief periods. It is conceivable that these properties of the orthography might induce the reader to give greater attention to word-by-word processing instead of sampling clues from larger stretches of prose. This could result in poorer comprehension of sentences and passages, since the reader focuses on the individual pieces which make up the total information content of passage, rather than on the ideas

contained therein.

Reading is, however, much more than the perception of visual forms; it results from the activation of cognitive strategies. We assume the validity of Goodman's (1967) psycholinguistic "guessing game" model of reading, which postulates an active process whereby the reader predicts the printed message from clue sampling and then confirms these predictions. Recent psycholinguistic research supports this model. Bever (1970) has demonstrated that native speakers employ various cognitive strategies to produce plausible interpretations of perceptually difficult sentences. These cognitive strategies, many of which must be language specific, incorporate knowledge of linguistic structure, e.g., clause units and the organization of the constituents of which they are composed. The decoding act which is reading takes the form of matching expectations based on these strategies with the actual message. Cowan (1976) has shown that in reading a second language, confusions often arise as a result of the reader's making predictions based on cognitive strategies in the native language.

The cognitive strategies employed by Persians to set up expectations in reading will differ markedly from English, due to the linguistic differences between the two languages. To cite but a few examples, the Persian expects the agent and the goal to be indicated in that order in the form of clitics bound to verb stems. The native speaker of English expects these concepts to be in the form of free morphemes--distinct words--in the sequence: subject, verb, object. The Persian native speaker expects attributive adjectives to follow head nouns; the English native speaker expects the reverse to be the norm. The Persian native speaker expects the definite-

indefinite distinction to be indicated by the presence or absence of three different morphemes, yek, un and ra. The use of these is dependent upon whether the definitivized form is in subject or object position and what kind of broader syntactic construction, e.g., interrogative, relative clause, is involved. English marks this distinction regardless of where it occurs by specific morphemes: a/the, this/that, these/those. In English, the reader expects the antecedent of a relative clause to be the noun phrase which appears to the immediate left of the relative pronoun. The native speaker of Persian expects the antecedent of the relative clause to appear as a clitic somewhere within the clause.

Our hypothesis is that the combination of cognitive and perceptual factors enumerated above lead to the bilingual children's developing two distinct attack strategies for reading the respective languages. The net effect of this is that the children do not read either language quite as well as their monolingual peers at any grade. We would not predict a similar outcome for languages with near identical orthographies, greater structural similarities, and a high number of cognates, as is the case with French and English. Transfer at some level, like that hypothesized by Lambert and Tucker for the St. Lambert first graders would be far more likely to occur under these conditions.

In concluding, we should stress that the parallel processing theory of reading for bilinguals is posited here as an empirically testable hypothesis. One possibility is that there is a cline ranging from maximum similarity between linguistic systems, and hence the development of greater competence in reading both

languages, to great dissimilarity between systems, which produces the need for developing two separate attack strategies for reading. Further research with different languages and different orthographies isneeded to test the extent to which the aforementioned factors contribute to the development of reading competence in bilingual children.

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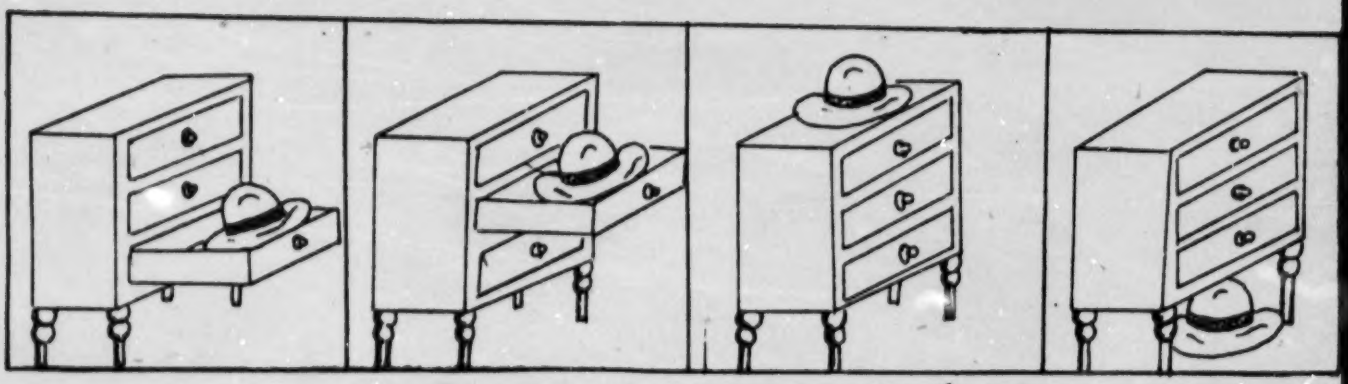
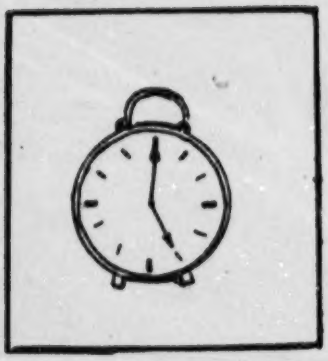
Figure 1



۱۸- کلاه در کشوی وسطی است

The hat is in the middle drawer.



ساعت	ساکت	ساخت	صامت
clock	quiet	make	silent

Figure 2

به آسانی می شود کاسبی را که در خیابان اجناس مختلف می فروشد حتی بدون دیدنش ___۲۷___ . هرکدام از این کاسب ها ___۲۸___ مخصوص خود دارند که به ما میگویند چه می فروشند .

(۲۷) مواظب بود　　خواند　　شناخت　　پرداخت　　دید

(۲۸) لباسی　　بوئی　　گلی　　گامی　　آوازی

We can easily ___27___ a peddler on the street without looking at him. Each peddler has his distinctive ___28___ which announces what he is selling

27. take care (of)　read　recognize　pay　see

28. costume　smell　flower　pace　cry

Table 1

Means and Variance for Persian Reading Comprehension and Vocabulary According to Grade, School and Home Language

Grade and Schools \ Home Language	Comprehension									Vocabulary								
	LM			LB			LE			LM			LB			LE		
	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2
Grade 1:																		
B/Im	24	14	37	12	16	38	9	13	19	24	35	45	12	31	57	9	30	68
B/ 1/2	18	16	44	5	14	25	21	12	15	18	38	67	5	35	34	21	32	72
P/up	25	19	51							25	41	14						
P/low	24	14	36							24	34	115						
Grade 3:																		
B/Im	35	27	64	9	20	70	9	14	60	35	37	65	9	34	81	9	30	83
B/ 1/2	18	28	28	12	26	77	12	19	63	18	37	79	12	35	57	12	28	96
P/up		33	64							30	47	13						
P/low		18	62							22	29	117						
Grade 6:																		
B/Im	29	41	44	21	39	46	13	29	237	29	28	47						
B/ 1/2	12	38	117	5	36	59	11	29	68	12	24	133						
P/up	32	49	15							32	43	26						
P/low	18	36	59							18	26	80						

N = number of subjects
LM = monolingual Persian home environment
LB = bilingual home environment (Persian and English)
LE = monolingual English home environment

ANOVA for Bilingual Schools and Monolingual Persian Control Schools

Source of Variation	Comprehension				Vocabulary			
	SS	df	MS	F	SS	df	MS	F
grade 1: schools	385.4	3	128.5	3.1*	756.3	3	252.1	4.0*
experimental error	3654.3	87	42.0		5444.7	87	62.6	
Total	4039.7	90			6201.0	90		
Grade 3: schools	3027.2	3	1009.1	17.6*	6506.0	3	2168.8	52.5**
experimental error	5297.8	101	517.4		4172.5	101	41.3	
Total	8825.0	104			10678.9	104		
Grade 6: schools	2345.9	3	782	17**	5706.6	3	1902.2	33.4**
experimental error	3996.8	87	45.9		4954.4	87	56.95	
Total	6342.7	90			10661.0	90		

*$P < 0.05$, ** $P < 0.001$

Table 2

Multiple Comparisons of Persian Reading Comprehensions And Vocabulary Means Among Schools

Comparisons	Comprehension $\hat{\psi}$	$\hat{\sigma}^2_{\hat{\psi}}$	$\hat{\psi}/\hat{\sigma}_{\hat{\psi}}$	Vocabulary $\hat{\psi}$	$\hat{\sigma}^2_{\hat{\psi}}$	$\hat{\psi}/\hat{\sigma}_{\hat{\psi}}$
Grade 1						
P/up - B/Im	4.8	3.4	2.6	6	2.8	3.6*
P/up - P/low	4.8	3.4	2.6	7.3	5.1	3.2*
Grade 3						
P/up - B/Im	5.8	3.8	2.9*	9.8	2.4	6.5*
P/up - B/ 1/2	5.4	4.6	2.6	9.3	3.4	5.2*
P/up - P/low	15.4	5.0	7 *	18.1	4.5	8.6*
B/ 1/2 - P/low	10	4.5	4.8*	8.8	9.6	2.8†
B/Im - P/low	9.6	5.0	4.6*	8.3	8.6	3.2*
Grade 6						
P/up - B/Im	8	1.7	6.2*	15	2.2	10 *
P/up - B/ 1/2	10.7	4.6	5.1*	18.6	6	7.7*
P/up - P/low	12.8	2.8	7.5*	17.2	3.4	*

Critical values: Grade 1 $\sqrt{3F_{.95}(3, 88)} = 2.88$

Grade 3 $\sqrt{3F_{.95}(3, 102)} = 2.88$

Grade 6 $\sqrt{3F_{.95}(3, 80)} = 2.88$

* = significant

† = marginally significant

Table 3

ANOVA for Bilingual Schools (Persian Reading)

Source of Variation	Comprehension				Vocabulary			
	SS	df	MS	F	SS	df	MS	F
Grade 1: ($\tilde{n}$=11.11)								
Bilingual schools	3.33	1	3.3	0.1	101.1	1	101.1	1.6
Home Language	132.21	2	66.1	2.1	323.3	2	161.6	2.6
Interaction	35.5	2	17.8	0.6	13.3	2	6.6	0.1
Error-Sw	2573.2	83	31		5194.6	83	62.6	
Total	2744.24	88			5632.3	88		
Grade 3: ($\tilde{n}$=12.5)								
Bilingual schools	291.2	1	291.2	4.96*	0	1	0	0
Home language	1518.3	2	759.1	12.93**	850.5	2	425.2	5.78*
Interaction	117.5	2	58.7	1.0	37.0	2	18.5	0.25
Error-Sw	5224.7	89	58.7		6551.8	89	73.6	
Total	7110.9	94			7420.5	94		
Grade 6: ($\tilde{n}$=12.24)								
Bilingual school	17.1	1	17.1	0.23				
Home language	1722.2	2	861.1	11.58**				
Interaction	30.6	2	15.3	0.21				
Error-Sw	7214.7	97	74.4					
Total	8984.6	102						

* $P < 0.05$

** $P < 0.001$

Table 4

Multiple Comparisons Among Persian Reading Comprehension and Vocabulary Means of Home Languages: Grades 3 and 6

Comparisons	Comprehension						Vocabulary		
	Grade 3			Grade 6			Grade 3		
	$\hat{\psi}$	$\hat{\sigma}^2_{\hat{\psi}}$	$\hat{\psi}/\hat{\sigma}_{\hat{\psi}}$	$\hat{\psi}$	$\hat{\sigma}^2_{\hat{\psi}}$	$\hat{\psi}/\hat{\sigma}_{\hat{\psi}}$	$\hat{\psi}$	$\hat{\sigma}^2_{\hat{\psi}}$	$\hat{\psi}/\hat{\sigma}_{\hat{\psi}}$
LP - LB	4	4.1	2	2.7	2.9	1.6	2.5	5.2	1.1
LP - LE	10.4	4.1	5*	11.6	4.8	5.3*	8.1	5.2	3.6*
LB - LE	6.4	5.9	2.6*	8.9	7.8	3.2*	5	7.4	2.1

Critical Value: $\sqrt{2F_{.95}(2, 89)} = 2.49$

Table 5

Means and Variance for English Reading Comprehension and Vocabulary According to Grade, School and Home Language

Home Language / Grades and Schools	Comprehension									Vocabulary								
	LM			LB			LE			LM			LB			LE		
	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2	N	$\bar{X}$	S^2
Grade 1:																		
B/Im	24	18	39	11	20	65	7	19	30	24	32	48	11	33	121	7	33	17
B/ 1/2	17	24		5	28	30	21	29	13	17	38	36	5	41	22	21	41	45
Eng/C							46	19	48							46	31	97
Grade 3:																		
B/Im	34	23	54	9	27	147	9	28	72	34	28	45	9	32	73	9	37	73
B/ 1/2	18	20	58	11	29	70	10	27	111	18	25	57	11	31	69	10	34	93
Eng/C							58	28	103							58	36	81
Grade 6:																		
B/Im	30	36	81	22	41	68	13	40	72	30	27	30	22	30	38	13	32	48
B/ 1/2	25	34	67	5	38	65	1	41	29	25	19	41	5	23	67	11	29	49
Eng/C							43	42	34							43	35	28

Table 6

ANOVA for Bilingual Schools (English Reading)

Source of Variation	Comprehension				Vocabulary			
	SS	df	MS	F	SS	df	MS	F
Grade 1: ($\tilde{n}$=10.34)								
Bilingual school	1009.2	1	1009.2	31.2**	849.9	1	849.9	16.8**
Home language	100.3	2	50.1	1.5	77.5	2	38.7	0.8
Interaction	24.8	2	12.4	0.4	3.1	2	1.5	0.03
Error-SW	2554.3	79	32.3		3991.5	79	50.5	
Total	3688.6	84			4922.0	84		
Grade 3: ($\tilde{n}$=12)								
Bilingual school	8.4	1	8.4	0.1	124.8	1	124.8	2.1
Home language	555.6	2	277.8	3.8*	843.6	2	421.8	7.0*
Interaction	91.2	2	45.6	0.6	13.2	2	6.6	0.1
Error-Sw	6220.8	85	73.2		5116.7	85	60.2	
Total	6876	90			6098.3	90		
Grade 6: ($\tilde{n}$=12.24)								
Bilingual school	60	1	60	0.9	624.2	1	624.2	15.8**
Home language	379.4	2	189.7	2.8	626.7	2	303.3	7.7*
Interaction	44.1	2	22.0	0.3	93.0	2	46.5	1.2
Error-Sw	6822.1	100	68.2		3956.5	100	39.6	
Total	7305.6	105			5300.4	105		

*P < .05

**P < .001

Table 7

Multiple Comparisons Among English Reading Comprehension and Vocabulary Means of Home Languages: Grades 3 and 6

Comparisons	Comprehension			Vocabulary		
	$\hat{\psi}$	$\hat{\sigma}^2\hat{\psi}$	$\hat{\psi}/\hat{\sigma}\hat{\psi}$	$\hat{\psi}$	$\hat{\sigma}^2\hat{\psi}$	$\hat{\psi}/\hat{\sigma}\hat{\psi}$
Grade 3						
LB - LP	5.8	5.1	2.6*	4.2	4.2	2.1
LE - LP	5.1	5.1	2.3	7.8	4.2	3.8*
Grade 6						
LB - LP				5.1	2.4	3.3*
LE - LP				6.8	2.4	4.4*

Critical Values: Grade 3 $\sqrt{2F_{.95}(2, 88)} = 2.49$

Grade 6 $\sqrt{2F_{.9}(2, 103)} = 2.4$

Table 8

ANOVA for Bilingual Schools and
English Control School (English Reading)

Source of Variation	Comprehension				Vocabulary			
	SS	df	MS	F	SS	df	MS	F
Grade 1:								
Schools	1906.5	2	953.2	24.9**	2104.3	2	1052.1	16.6**
Experimental error	4922.2	129	38.2		8480.5	129	65.7	
Total	6828.7	131			10584.8	131		
Grade 3:								
Groups	1086.1	2	543.0	6.5	2039.3	2	1019.6	14.8**
Experimental error	12260.9	146	84		10026.2	146	68.7	
Total	13347	148			12065.5	148		
Grade 6:								
Groups	1374.4	2	687	12.0**	4313.8	4	1078.2	29.4**
Experimental error	8376.6	142	57.4		5281.6	144	36.7	
Total	9751	144			9595.4	148		

*P < 0.01

**P < 0.001

Table 9

Multiple Comparison of English Reading Comprehension and Vocabulary Means Among Groups

Comparisons	Comprehension			Vocabulary		
	$\hat{\psi}$	$\hat{\sigma}^2\hat{\psi}$	$\hat{\psi}/\hat{\sigma}\hat{\psi}$	$\hat{\psi}$	$\hat{\sigma}^2\hat{\psi}$	$\hat{\psi}/\hat{\sigma}\hat{\psi}$
Grade 1:						
B/ 1/2 - B/Im	8.4	1.5	6.8*	7.7	1.9	5.6*
B/ 1/2 - Eng/C	7.7	2	5.4*	9.2	3.5	4.9*
Grade 3						
(LB + LP) - LP	5.4	3.2	3*	6	2.7	3.6*
Eng/C - LP	5.9	2.9	3.5*	8.5	2.4	5.5*
Grade 6						
(LB + LE) - LP	5	2.8	3*			
Eng/C - LP	7.2	2.3	4.7*			
B/Im, LP - B1/2, LP				7.8	2.5	4.9*
Eng/C - B/Im, LP				8.2	1.6	6.5*
B/Im, (LB+LE) - B/ 1/2, LP				11.3	2.8	6.7*
Eng/C - B/ 1/2, LP				16	2.1	11*
Eng/C - B/ 1/2 (LB+LE)				8.2	3.1	4.6*

Critical Values: Grade 1 $\sqrt{2F_{.999}(1, 129)} = 3.83$

Grade 3 $\sqrt{2F_{.95}(2, 146)} = 2.48$

Grade 6
Comprehension: $\sqrt{2F_{.95}(2,146)} = 248$

Vocabulary: $\sqrt{9F_{.95}(9,139)} = 4.2$